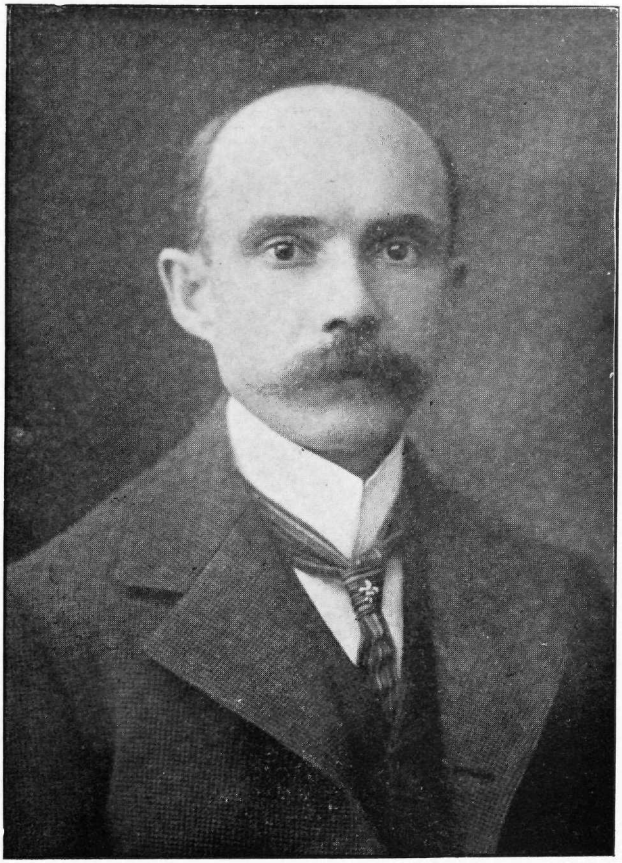
SNAP SHOTS TAKEN IN AND ABOUT THE MINES OF ENGLAND AND SOUTH WALES.

EDWIN D. HASELTINE, YOUNGSTOWN, O.

We Americans are apt to smile at the attempts of foreign visitors to write up our institutions after a visit of a few weeks or even months, and I am afraid my paper may excite the same feelings in the breast of any native of Great Britain who may chance to hear it, for my observations were confined to only four mines and three days' time. However, as I saw many things of interest to me, I will describe them for your benefit.

The geology of Great Britain has been so fully written up, and is no doubt so familiar to all of you who have taken an interest in the subject, that I shall not attempt any description of the number of seams mined, nor their thickness or qualities. There is another reason in the case of the Welsh mines, I cannot pronounce their names even when the chart is before me. Their double "L's" and "Y's" are too much for my American tongue. For instance here is the name of a town in Wales, "Ynysybwl," now what does that spell?

I attempted to see only one representative colliery each, of Scotland, Wales and England. For Scotland "Earnock" was selected, as it was said to be the best rigged mine in that country. It is situated at Hamilton, about twelve miles from Glasgow, on the Caledonian Railroad. The colliery consists of three shafts numbered 1, 2 and 3. Number 1 is sunk to the lowest seam worked. It is used to raise and lower men and material to the first seam worked, and for the air shaft for all four seams. Number 2 shaft, situated about 100 feet from number 1, is sunk 720 feet to the first seam worked, and is used to raise the coal only. Number 3 shaft is situated about 250 feet from number 2, and is sunk 870 feet to the lowest seam worked. It is used for both men and coal and has no connection with the number 2 shaft. Number 2 has been working for several years, the hoisting engines are two first-motion engines 17 feet apart, with 28 inch cylinders and a 54 inch stroke. The drum, 14 feet in diameter, is situated between them. The shive wheels are also 14 feet in diameter: time of hoisting 32 seconds. The shaft is 7 x 12



EDWIN D. HASELTINE

feet, the slides are "T" iron of about 60 pounds weight per yard, and the rope is 1¼ inches in diameter. Around the bottom all is arched with brick. A single engine runs four sets of tail ropes, each about 3,900 feet long. Two engineers throw into or out of motion any pair of drums at will. The cages raise four cars at a time, the bottom being so arranged that they are all put on and off at the same time. All the coal from one side goes to the top lift, and all from the other to the bottom lift. The second and third seams, situated respectively 36 and 66 feet below the bottom of the shaft, are reached by a slope having a gradient of 1 in 12. An endless rope 9,000 feet long brings the coal from these veins in strips of 18 cars each. I neglected to ask why the shaft was not sunk to the lowest vein and the coal dropped down to it from the No. 1 and 2 veins, but I suppose there was a reason, although not apparent to me. The capacity of the mine cars is only 1,500 pounds of unscreened coal, and the track gauge 23 inches. All of the mine that I saw was substantially level, but the foreman said that at the far end it raised as fast as 1 in 4, and for that reason they could not use larger cars. The capacity of the railroad cars is from 7 to 10 tons, I saw none larger than 10 tons. The coal from Nos. 1 and 2 veins is mined long wall. The top rig at the No. 2 shaft is somewhat primative. Plates are used instead of rails, and as the different coals are kept separate, there are three schutes. Two grades of coal, lump and slack, are made. The screens consist of plates punched full of holes, and lying much nearer horizontal than usual with us. A small engine by shaking them keeps the coal moving; it drops from the lower end of the screen onto a carrier about 50 feet long, from the end of which it again drops into a railroad car. A row of men and girls standing along either side of this carrier pick out all the impurities. The carrier is so made that the plates that carry the coal return in a vertical position, so as to scrape back to the foot of the screen, all the fine coal that falls through while on the journey to the car. Here all the slack is taken by a carrier, running at right angles to the schute, to a slack car. The slack from one vein is washed.

The number 3 shaft has been working for about two years, and is much more modern in its equipment. It raises the coal from the fourth vein only, but as it is of two qualities, the "virgin" 4 feet thick and the "splint" 3 feet thick, they are kept separate. The hoisting engines are on first-motion, with 30 inch cylinders and a 5 foot stroke. Size of drum 16 feet diameter, time of hoisting 25 seconds, a rate of about 31 per second; two cars being brought up at a time. The bottom is lighted with electric light,

and is all arched with four rings of fire-brick, the arch is about 25 feet high and of about the same width. The track gauge is 24 inches and the same little cars are used.

The main haulage ways radiate from the shaft in such directions as circumstances dictate. At what is called the "first working" all the territory lying between these main entries is laid out into blocks, each about 50 yards square, by driving entries at right angles to each other. At the "strooping," or second working these blocks are mined by taking a slice of about 15 feet off of say the north side and at the same time one of the same width off of say the west side. This system is continued until the block is all mined, when the next one is attacked in the same manner.

The vein is ventilated by twelve separate circuits of air. Barriers are left between each system so there can be no leakage from one to another.

I attempted to photograph the map of this mine but it was a failure. The top rig is also more modern than at the number 2 shaft. The cars are dumped sidewise in a cradle into a hopper, at the bottom of which a carrier about 6 feet long takes the coal to the top of the screen, which is a bar one of 1¼ inch spaces and of about 5 x 12 feet area. By this plan the coal goes slowly over the screen in small quantities, and is thoroughly cleaned of fine coal. A carrier 54 feet long, similar to the one already described, takes the screened coal to the cars, and the fine coal is also disposed of as already described. A single Guibal fan, of 40 feet diameter and blades 12 feet wide, ventilates all four seams. It has a capacity of 230,000 cubic feet per minute at a velocity of 47 revolutions per minute, and is hitched directly to an engine.

Every precaution is taken to prevent an explosion; ten inspectors examine all parts of the mine every morning, and each one signs a report of which the following is a copy:

Fireman. (General Rule 4.)

Monday,.....

I report that, between..... and .....
I inspected, with locked safety lamp, the parts of this Mine in which men are to work or pass during the shift, so far as Presence of Gas, Ventilation, Roof and Sides, and General Safety are concerned, and found them safe except
Gas found in
Ventilation,
Roof—Sides; bad in
Bar., Ther.,

Ten roadsmen also make a daily examination and sign the following report:

Roadsman. (General Rule 5, and what is defined in the Special Rules as Roadsman's Duties.)
Monday, ...189
I report that, between ..... and .....
I examined the state of the Guides and Conductors in the Shaft, and all Ropes, Chains, Wheels, and other similar appliances in actual use below ground Fences, Manholes, Roof and Sides of Traveling Roads, and found them safe and in proper working order.

These reports are copied into a record book in which is kept a daily record of the mine. All the facts pertaining to every accident, no matter how trifling, are written down, so that in case of a personal injury suit they are able to tell who were witnesses, and have the data necessary for a successful defense.

All the buildings are of brick, and are kept scrupulously clean. I saw a woman on hands and knees scrubbing one of the engine-house floors. The capacity of the number 2 mine is about 1,800 tons a day, and that of the number 3, when fully developed will be about 1,000 tons. It was an interesting plant to visit, the manager, Mr. Moody, courteously showed me everything I wished to see and answered my numerous questions; but I saw nothing, except their ponderous engines, that was an improvement on our own best equipped mines.

The Cardiff Exposition was next visited; here I saw many mining exhibits, of which the following are the most interesting: Models of coal handling machinery; four geological columns, one of which was very fine, showing all the different strata to a depth of 2,280 feet; two plans of long wall mining; diagrams showing the fluctuations in wages from 1864 to 1896, and the fluctuations in the price of coal from 1846 to 1896; specimens of fossils, diamond drills, safety cages, plans of the Cardiff docks, ten samples of coal, patent safety water cartridge, with coal dust tamping, and fired by electricity; photographs of several collieries, engineering instruments, picks, wire rope, coal handling machinery and one fan. They also had on exhibition, in actual operation, a genuine coal mine and an American gold mine, both of which were, of course, to a certain extent frauds.

Cardiff is the largest coal shipping port in the world. Last year they loaded 13,000,000 tons, and the annual increase is about 1,000,000 tons. It is made so by the superior quality of their steam coal, which sells from 2 to 3 shillings in advance of any

other steam coal known. All the English navy, and nearly all the trans-Atlantic liners are coaled with it. The "greyhounds" are not able to carry enough for a round trip, and are never able to maintain the same speed after the Welsh coal is exhausted and they are compelled to use the American.

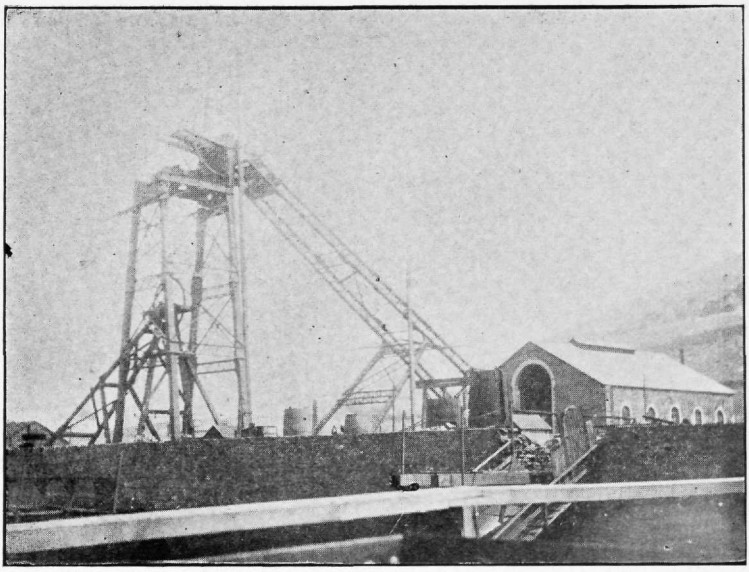
The composition of this coal is as follows:

Fixed carbon	88 to 90 per cent.
Volatile matter	8 to 10 per cent.
Ash	1½ to 2 per cent.
Sulphur	$\frac{58}{1000}$ per cent.
Moisture	Not taken.

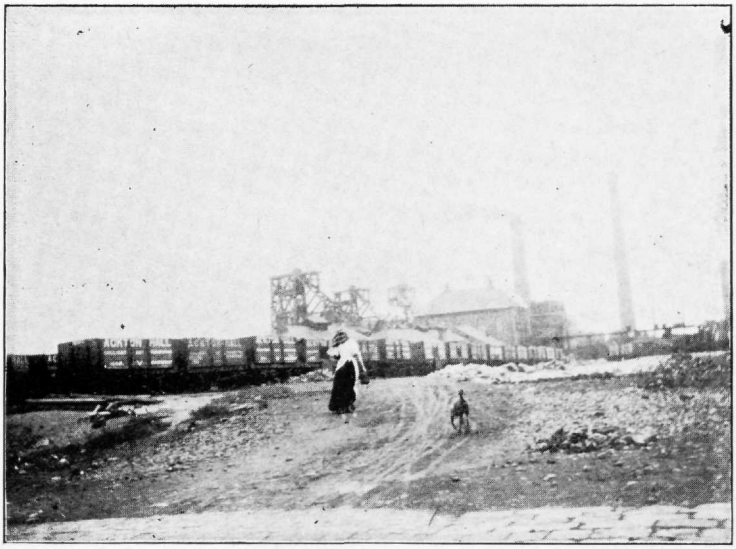
The retail price of this coal in Cardiff ranges from $4.50 to $5.00 per ton delivered, in fact all British coal sells for more than our soft coal does. The following are the London quotations for the last week in July:

London Coal.—A very quiet tone prevailed at yesterday afternoon's market, which, as usual on Wednesdays, was thinly attended. Merchants' trade, though better than last month, was reported to be still below the July average, and consequently there was still a disinclination to purchase supplies in any quantity. There was a fair inquiry for seaborne house coal, but nothing was offered, and therefore the official quotation of 12s ($3.00) for Hetton-Lyons, and 13s ($3.25) for Hetton-Wallsend are only nominal. Business in rail coal mostly runs on the cheaper descriptions of cobbles and nuts from Warwickshire and neighboring counties having low railway rates, and in these cases prices were firm, 5s 6d ($1.37) being made for Warwickshire cobbles and nuts, while Nottinghamshire nuts offer 3d (6 cents) less, and cobbles at 5s ($1.23). Barnsley softs, however, still were obtainable very cheaply, and some bests from a second-class colliery have been recently sold at 5s 6d ($1.37) at the pits. Warwickshire, Leicester, and Nottingham steam coals also remain firm, with a fair trade; while Welsh, although slow, was steady at 13s ($3.31) to 13s 3d ($3.37) for best Cardiff sorts, and Northumberland Hartleys were firmly quoted at 11s ($2.75) to 11s 3d ($2.83). During the past two days 20 coal-laden vessels have arrived.

I visited the docks and saw vessels loaded. They have three different kinds of loaders. The first one may be described as being just like a self-dumping cage. A frame similar to the head rig of a shaft is carried on a track parallel to the face of the dock, so as to be moved to suit the position of the vessel being loaded. A car is run onto it and raised to a height of 14 feet, at which elevation the platform tips up to an angle of 35 to 40



THE ALBION MINE, POUTYPRIDD, WALES.



THE ACKTON HALL COLLIERY, FEATHERSTONE, ENGLAND.

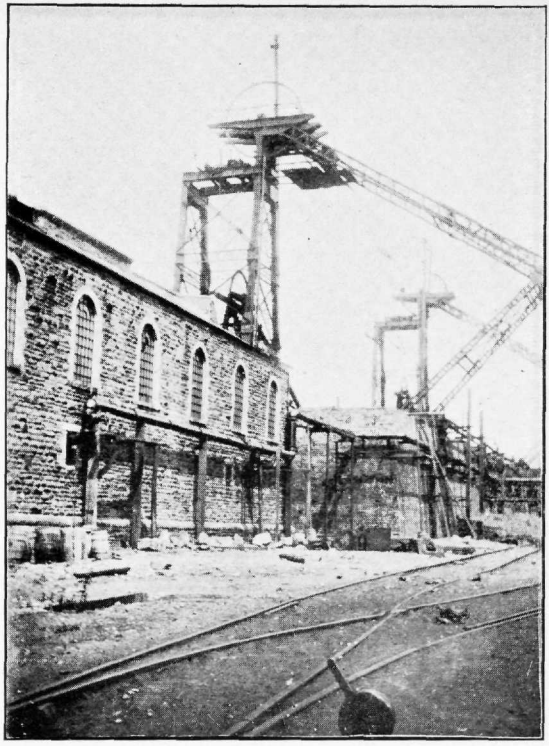
degrees, the end-gate of the car is raised and the coal runs down a schute into the hold of the vessel. They were dumping about five tons a minute. The cars were moved as follows: an upright capstan run by underground machinery stands near the loader, it is thrown into or out of motion by a foot lever. A rope is fastened to the car, two or three turns are thrown around the capstan, the lever is pushed down, the capstan revolves, and the car is drawn onto the platform. The empty cars run off by gravity. The second loader was like the first, except that the tracks were elevated to such a height that it was not necessary to raise the coal any. The third was the old style of buckets and a crane.

At Cardiff the American Consul, our fellow member, the Hon. Anthony Howells, gave me a hearty welcome, asked about the welfare of the Society and advised me to visit the "Albion" and "Dowlies" mines situated at Pontypridd, twelve miles distant. On this journey three blast furnaces and a mill, all abandoned and in ruins, were passed, and at one place the three beautiful towers of Crosier Castle could be seen rising above the tree tops on the mountain side; a combination of ruins, romance and medieval grandure, impossible in a country so young as our own.

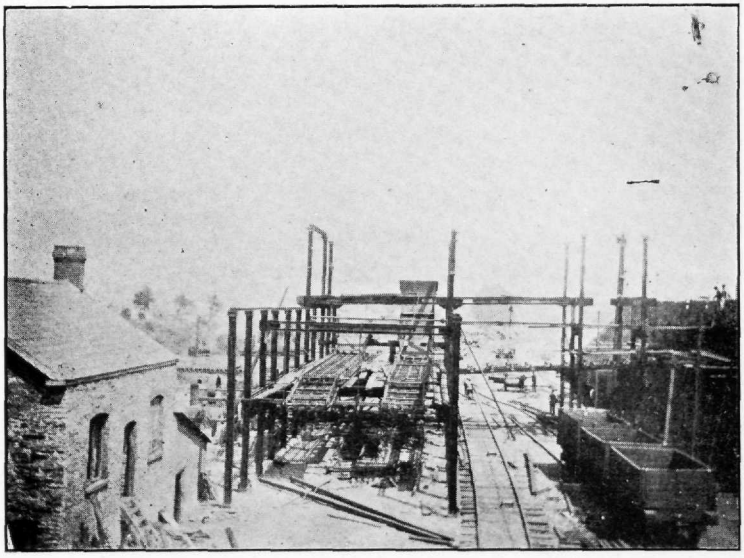
The "Albion" colliery was the scene of a very disastrous explosion a few years ago. It consists of two shafts about 100 feet apart, one an air shaft, also used to lower men and materials, and the main hoisting shaft. Both have wooden head rigs with the usual big shive wheels. The main shaft is an end hoist. The engines have 42 x 72 inch cylinders, and are able to bring up a cage in 45 seconds. The drum is a cone, diameters from 16 to 25 feet. The height of the tipple is 20 feet above the rail. They make only two kinds of coal, lump and slack, of which 66 per cent. is lump, over an $1\frac{1}{4}$ inch screen. Two cars are brought up at a time, they are weighed before being screened, and a "billy fair-play" shows the amount of slack. Iron cars are used, two iron bars serve for an end-gate, both of which have to be unfastened by hand before the car is dumped, after which it is pushed around to the back of the shaft and the empties are pushed onto the cage as the loaded ones are run off. Their method of handling coal could easily be improved upon; there were fourteen men employed in dumping, and one of them told me that the full force was not out that day. I did not go down the shaft, as the superintendent had not yet arrived and those present were very much afraid of overstepping their authority in allowing me to do so. Individual cars are used by this company, their capacity is 10 tons, tare $5\frac{1}{2}$ tons.

The "Dowlies" colliery is a new one, not yet in full working order, although seven years have been spent in opening it. The plant consists of two shafts sunk 2,220 feet to the famous Welsh steam coal, one for hoisting and the other for air and to raise and lower men and supplies; two hoisting engines; one fan, with engine attached, and one air compressor. All the buildings are of stone and present an air of stability not often seen in our country; the office was fitted up with a bath-room, dressing-room and all the conveniences of a modern dwelling-house. The hoisting engine at the air shaft is on first-motion, its cylinders are 36 inches in diameter, the stroke is 6 feet, and the drum, a plain one, has a diameter of 17 feet. The engines at the hoisting shaft are also on first-motion, they are 24 feet apart, cylinders 42 inches in diameter, stroke 7 feet, drum, a conical one, smallest diameter 17 feet, largest diameter 32 feet. The head rig is of steel and is 75 feet high, shive wheels 16 feet diameter. The arrangement of the screens will be similar to the ones at "Earnock." Their pump, a Cornish one, has a capacity of 75,000 gallons per hour; it is run by a double engine, the low pressure cylinder has a diameter of 78 inches, the high one 48 inches and the stroke is 10 feet. The water is raised by three lifts. The mine cars run on a 3 foot 2 inch gauge and have a capacity of 2½ tons. The vein dips to the north at a rate of 8 inches per yard, it varies in thickness from 6 feet 8 inches to 9 feet 3 inches, the usutl thickness being the former. It has but two very thin partings. The system of mining is by long wall, but only one face has been commenced. Compressed air runs the inside engines, of which there are two, one at the top of each dip heading. Their system of ventilation is not yet in working order; the compressor engine supplies all the air now used, which is carried to the face of the headings in pipes. The daily capacity of this mine when fully developed will be about 2,000 tons. The cost of opening nearly $250,000. The shaft passes through several seams of mineable coal, but in South Wales their main reliance is this one vein of steam coal. These collieries are very costly to operate, sometimes prove "Bonanzas" and sometimes costly failures. Miners' wages are about 75 cents a day, but they have the advantage of living in good houses. Those at Pontypridd were built of a beautiful combination of red and fire brick, the little yard in front of each one being enclosed by a brick wall, and all of them full of flowers: a marked contrast to the frame "shanties" surrounded by weeds too common to many of our mining villages.

The "Dowlies" was by all odds the best equipped colliery that I saw. It looked more like an American mine than any of the others, and as if they were preparing to do "business."



HEADRIGS AND BUILDINGS, DOWLIES MINE, POUTYPRIDD, WALES.



TIPPLE IN COURSE OF ERECTION AT THE DOWLIES COAL AND IRON CO.S MINE.

Our Consul at Bradford, England, the genial and affable Hon. Claude Meeker, formerly of Cincinnati, Ohio, advised me to visit the "Acton Hall" colliery, situated at Featherstone, twenty-four miles distant. The plant consists of five shafts, three for hoisting, one for air and one for water; a coking outfit of one hundred ovens; the usual number of hoisting engines and an electric plant that furnishes all the power used, except the hoisting. The shafts are situated on a row of not more than 200 feet in length. The hoisting engines are similar to the ones already described. The fan has a diameter of 24 feet and a capacity of 200,000 feet per minute. The coal is dumped in a cradle onto a screen consisting of plates punched full of 2½ inch holes, under which is another plate full of 1½ inch holes, both nearly level and shaken by an engine. The lump coal is taken from the end of the screen on a carrier, along which men and boys stand and pick out the impurities; the end of the carrier inclines downward so as to be only as high as the top of a railroad car, so the coal is loaded with very little breakage. The fine coal is taken in railroad cars about two hundred feet to a separator, which is by far the finest I have ever seen. The building is all iron, the coal is elevated 50 feet, and by means of revolving screens, separated into four grades of fine coal, all washed. Their proportions of coal are as follows:

Lump (2½ in.)	51 per cent
Double nut	9 per cent.
Single nut	15 per cent.
Pea	15 per cent.
Bean	10 per cent.
Total	100 per cent.

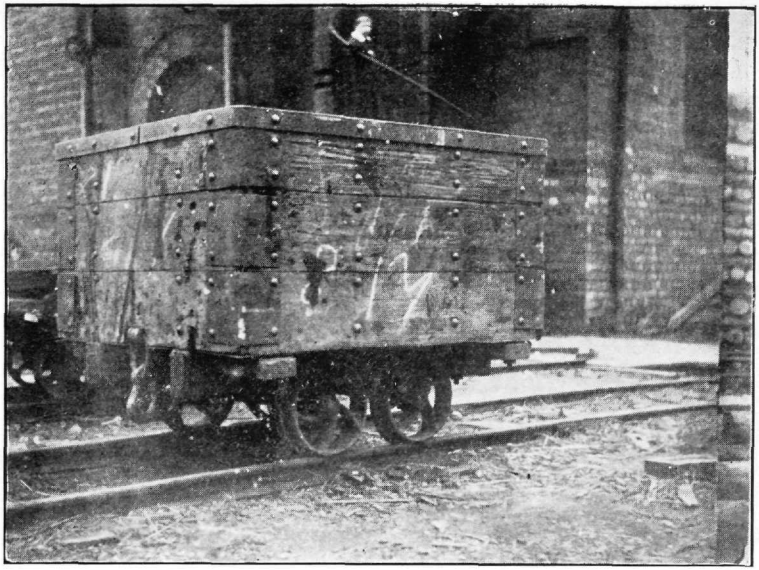
A crusher grinds up the bean and it is coked, if the trade for other grades of fine coal is dull they are also crushed and coked.

The coking plant is one of those by which the by-products are saved, but it was not yet in working order. The depths of the shafts are as follows: No. 1, 1,800 feet; No. 2, 1,200 feet; No. 3, 990 feet. At No. 1 six cars are brought up at a time, at Nos. 2 and 3 four. The cages have two parallel tracks on them. Mine cars have a capacity of 1,000 pounds, their size is 3 feet 9 inches x 3 feet 3inches x 2 feet, gauge of track 24 inches, size of wheels 10 inches. The seams of coal are substantially level, but they say they cannot use larger cars on account of the poor roof. I went down one shaft but saw nothing there out of the ordinary. Their haulage was by means of three sections of endless rope

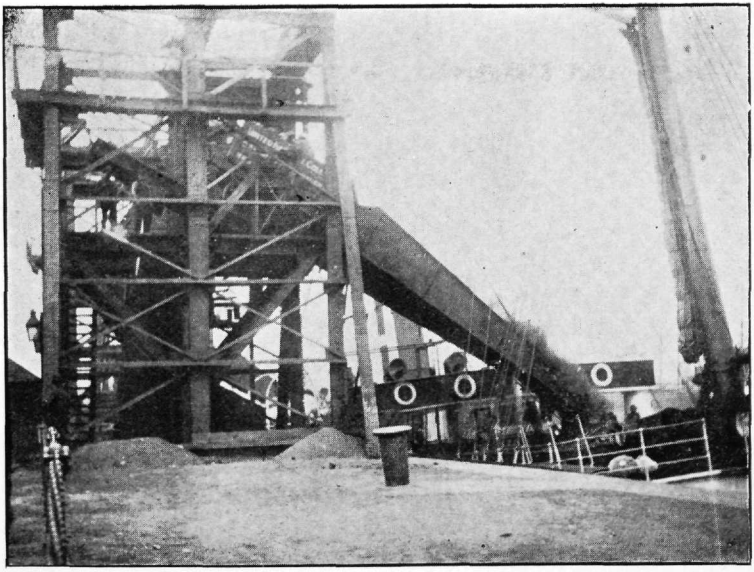
carried about 4 feet above the track on horizontal shive wheels having large flanges. At the end of each section another rope was carried up a butt entry. Cars have to be unhitched and hitched on again at the end of each section. A chain fastened to the car and wound three or four times around the rope hauls them. The capacity of this colliery is about 1,800 tons a day. Royalty in this vicinity ranges from 7 to 12 cents per ton. Miners earn as much as $1.50 per day; however operators have "troubles of their own" with their men. Mr. H. St. John Dumford, the general manager, told me that the output in that district declined last year, owing to labor troubles, 2,000,000 tons; while in the North of England, where they were comparatively free from them, the output increased 4,000,000 tons.

In my visits to these mines I was treated with every courtesy and afforded every facility to see all that was to be seen. I was asked all manner of questions about American mines and American things in general. One superintendent was surprised that I did not know a friend of his who had charge of some mines in Missouri. If any of you go to "yon" side take letters of introduction with you, my own were the keys that unlocked all doors. As Mr. Wallace, of "Earnock" colliery, turned over my letter from President-elect William McKinley to read the next one, he said, "McKinley, ah! he is the rascal who has caused us so much injury with his tariff bill, you should tear that one off if you want favors in Scotland." However he granted all I asked: I suspect the one from the Inspector and the one from the Governor, with the seal of the State on its corner, did the business. The law requires all mines to be surveyed once every three months, the only instruments I saw were rather primitive looking compasses. Only link chains are used. I saw one engineer suspend the plumb-bob from the roof and set the compass under it. Miners seem to be more contented and to work much nearer full time than ours have done for the last few years.

In conclusion I will say that there are few new things to be seen there that are of practical use to us. Foreign born miners have brought over and put into use all their good ideas as fast as they came out. They do not seem to have studied the problem of economy in day hands; at all the collieries visited there were about as many of them employed as miners. At "Acton Hall," out of a total of 840 men, 350 were miners. However their coking and slack washing plants greatly increased the number of day hands. As I said before, at the "Albion" colliery they were employing fourteen men to dump 1,000 tons. At "Acton Hall" the dumping was done by contract at a cost of 2



AN ENGLISH MINE CAR, CAPACITY 1000 POUNDS.



VESSEL LOADING MACHINE AT CARDIFF, WALES.

cents per ton, and there seemed to be a surplus of men everywhere. Aside from the wonderful size and speed of their hoisting engines, the cleanliness and stability of their fixtures and the care to prevent breakage of coal, I saw nothing that surprised me.

Mr. Haseltine then exhibited to the audience some interesting stereoptican views made from snap-shots taken by him, which he explained entertainingly, and which were much enjoyed by those present.

PRESIDENT RAY: Mr. Haseltine has certainly afforded us a half hour of great enjoyment and much information.

Mr. Miller moved a vote of thanks to Mr. Haseltine for his interesting and enjoyable paper and illustrations. Same seconded and unanimously carried.

PRESIDENT RAY: If no questions are desired to be asked Mr. Haseltine, we will pass to the next paper, by Mr. Edward Jones, of Oglesby, Illinois, on the subject of "Long Wall Advancing, Its Application to Mines in Ohio."

MR. JONES: Before I undertake to read this paper, I wish to state that it is a slice of a correspondence between myself and District Mine Inspector Thomas H. Love, which I have been asked to read to you. I say this because I do not want any of you to think I have had any idea of coming all the way from Illinois to Ohio to carry any information to this august body of scientists and mining engineers.

I worked in the Sunday Creek valley for a number of years before 1891, and I had a longing to return and visit old friends, and I arranged to attend this meeting at the same time.

This correspondence with Mr. Love was provoked—I use the term "provoked" in a kindly sense—by an article written by him entitled "Mining Ohio Coal." The kind invitation of your Chief and of Mr. Love brought me here to read to you what I have written to Mr. Love. I assure you I have "no ax to grind"; I am simply on a visit and have listened with much pleasure to the valuable papers which have been read at this meeting. I may say that I feel encouraged in my efforts to-night, since I have seen the name of Rutledge of Illinois on the roll here,

though I have no personal acquaintance with the gentleman, for the name Rutledge, especially Walton Rutledge, carries with it a great weight of scientific and practical knowledge of the various methods of working throughout the State of Illinois. So I will rely upon my fellow "statesman" to come to my assistance, for I will certainly become embarrassed under the cross-fire of these Ohio sharpshooters.

I have just stolen these few minutes to try to steady my nerves a little.

I must say further that the subject as it appears on the program, I am not just responsible for, though I do not complain of it. I do not recognize anything as long wall advancing work that does not take with it the whole seam, leaving but the pillars at the bottom of the shaft; and under certain conditions I would take those out also.

The following paper was then read by Mr. Jones: